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ACRONYMS

°C	degrees Celsius
CFR	Code of Federal Regulations
DCG	derived concentration guide
DOE	U.S. Department of Energy
DOE/PORTS	facilities operated by DOE (not leased to USEC) at the Portsmouth Gaseous Diffusion Plant
ENE	east-northeast
ft ³	cubic feet
g	gram
kg	kilogram
km	kilometer
L	liter
m	meter
m ³	cubic meter
FCi	microcurie
Fg	microgram
Fm	micrometer
Frem	microrem
mg	milligram
MGD	million gallons per day
mL	milliliter
mrem	millirem
NA	not applicable
NE	northeast
NPDES	National Pollutant Discharge Elimination System
NR	not reported
pCi	picocurie
PK	Peter Kiewit
PORTS	Portsmouth Gaseous Diffusion Plant
s	second
SU	standard unit
USEC	United States Enrichment Corporation

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1. INTRODUCTION

Environmental monitoring at the Portsmouth Gaseous Diffusion Plant (PORTS) is conducted throughout the year. Monitoring demonstrates that the site is a safe place to work, that plant operations do not adversely affect neighboring communities, and that activities comply with federal and state regulations.

This document is a compilation of the environmental monitoring data for calendar year 1999 and is intended as a tool for analysts in environmental monitoring, environmental restoration, and other related disciplines. The data in this document form the basis for the summary information in the *Portsmouth Annual Environmental Report for 1999* (DOE/OR/11-3052&D1).

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2. ENVIRONMENTAL MONITORING

This section provides environmental monitoring data collected by both the Department of Energy (DOE) and the United States Enrichment Corporation (USEC) at or nearby PORTS. Data is included for both DOE and USEC National Pollutant Discharge Elimination System (NPDES) outfalls and for the following USEC monitoring programs:

- Ambient air
- Direct radiation
- Surface water
- Sediment
- Soil
- Vegetation
- Biota.

The following tables are included in this section:

- Table 2.1. Uranium concentrations in DOE and USEC NPDES outfall water samples for 1999
- Table 2.2. Radioactivity concentrations in DOE NPDES outfall water samples for 1999
- Table 2.3. Radioactivity concentrations in USEC NPDES outfall water samples for 1999
- Table 2.4. DOE/PORTS NPDES permit summary for 1999
- Table 2.5. 1999 DOE NPDES discharge and compliance rates
- Table 2.6. 1999 USEC NPDES discharge monitoring results
- Table 2.7. USEC ambient air monitoring program alpha, beta high volume air samplers and gaseous fluoride – 1999
- Table 2.8. USEC ambient air monitoring program alpha, beta low volume air samplers – 1999
- Table 2.9. USEC direct radiation monitoring program quarterly external gamma radiation measurements (mrem) – 1999
- Table 2.10. USEC direct radiation monitoring program summary of quarterly external gamma radiation levels (Frem/hr) – 1999
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- Table 2.13. USEC soil monitoring program results – 1999
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- Table 2.16. USEC biota (crops) monitoring program results - 1999

**Table 2.1. Uranium concentrations in DOE and USEC
NPDES outfall water samples for 1999**

NPDES outfall	Number of samples ^a	Concentration		
		Minimum (mg/L)	Maximum (mg/L)	Average (mg/L) ^b
<i>DOE outfalls</i>				
012	12(7)	<0.001	0.0013	—
013	12(3)	<0.001	0.0039	—
015	12(5)	<0.001	0.0094	—
608	12(8)	<0.001	0.0015	—
610	12(5)	<0.001	0.0344	—
611	12(1)	<0.001	0.0216	0.0120
<i>USEC outfalls</i>				
001	52(24)	<0.001	0.0043	—
002	48(0)	0.0010	0.0044	0.0024
003	51(0)	0.0025	0.0607	0.0156
004	51(0)	0.0013	0.0400	0.0030
005	1(1)	<0.001	—	—
009	50(0)	0.0029	0.0085	0.0055
010	50(0)	0.0018	0.0086	0.0038
011	50(29)	<0.001	0.0024	—

^a Number in parentheses is the number of samples that were below the detection limit.

^b Averages were not calculated for outfalls which had greater than 15% of the results below the detection limit. For outfalls with less than 15% of the results below the detection limit, any result below the detection limit was assigned a value at the detection limit for calculating an average for the parameter.

**Table 2.2. Radioactivity concentrations in DOE
NPDES outfall water samples for 1999**

NPDES outfall	Number of samples ^b	Concentration			DCG ^a (pCi/L)
		Minimum (pCi/L)	Maximum (pCi/L)		
<i>gross alpha</i>					
012	12(8)	<0	6	NA	
013	12(9)	<1	18	NA	
015	12(10)	<2	10	NA	
608 ^c	12(11)	<2	15	NA	
610 ^c	12(2)	<1	63	NA	
611 ^c	12(1)	<2	115	NA	
<i>gross beta</i>					
012	12(7)	<2.95	16	NA	
013	12(11)	<5	43	NA	
015	12(4)	<14	292	NA	
608 ^c	12(4)	<3	25	NA	
610 ^c	12(2)	9	35	NA	
611 ^c	12(1)	<2	23	NA	
<i>technetium-99</i>					
012	12(10)	<-2	6	100,000	
013	12(12)	<21	<28	100,000	
015	12(6)	<7	323	100,000	
608 ^c	12(12)	<21	21	100,000	
610 ^c	12(11)	<2	24	100,000	
611 ^c	12(12)	<21	22	100,000	
<i>americium-241</i>					
012	1(1)	<0.073	—	30	
013	1(1)	<0.23	—	30	
015	1(1)	<0.41	—	30	
608 ^c	1(1)	<0.021	—	30	
610 ^c	1(1)	<0.080	—	30	
611 ^c	1(1)	<0.018	—	30	
<i>neptunium-237</i>					
012	1(1)	<0.028	—	30	
013	1(1)	<0.0000093	—	30	
015	1(1)	<0.023	—	30	
608 ^c	1(1)	<0.075	—	30	
610 ^c	1(1)	<0.096	—	30	
611 ^c	1(1)	<0.030	—	30	
<i>plutonium-238</i>					
012	1(1)	<0.26	—	40	
013	1(1)	<0.046	—	40	
015	1(1)	<0.023	—	40	
608 ^c	1(1)	<0.075	—	40	
610 ^c	1(1)	<0.064	—	40	
611 ^c	1(1)	<0.042	—	40	

**Table 2.2. Radioactivity concentrations in DOE NPDES
outfall water samples for 1999 (continued)**

NPDES outfall	Number of samples ^b	Concentration		DCG ^a (pCi/L)
		Minimum (pCi/L)	Maximum (pCi/L)	
<i>plutonium-239/240</i>				
012	1(1)	<0.00000047	—	30
013	1(1)	<0.046	—	30
015	1(1)	<0.091	—	30
608 ^c	1(1)	<0.068	—	30
610 ^c	1(1)	<0.064	—	30
611 ^c	1(1)	<0.021	—	30
<i>thorium-230</i>				
015	1(1)	<0.064	—	300
610 ^c	1(1)	<0.27	—	300
611 ^c	1(1)	<0.085	—	300

^a Derived Concentration Guide. A derived concentration guide is not available for gross alpha or gross beta.

^b Number in parentheses is the number of samples that were below the detection limit.

^c These outfalls discharge to USEC NPDES Outfall 003 (X-6619 Sewage Treatment Plant).

**Table 2.3. Radioactivity concentrations in USEC
NPDES outfall water samples for 1999**

NPDES outfall	Number of samples ^a	Concentration	
		Minimum (pCi/L)	Maximum (pCi/L)
<i>gross alpha</i>			
001	52(29)	<2	18
002	48(35)	<4	12
003	51(1)	<7	232
004	52(46)	<7	40
005	1(1)	<3	—
009	51(20)	<3	11
010	51(25)	<2	13
011	51(46)	<1	10
<i>gross beta</i>			
001	52(12)	<6	87
002	48(15)	<8	27
003	51(0)	28	217
004	52(5)	<21	265
005	1(0)	9	—
009	51(27)	<7	103
010	51(21)	<6	43
011	51(33)	<6	40
<i>technetium-99</i>			
001	52(44)	<10	75
002	48(47)	<10	28
003	52(14)	<20	161
004	52(51)	<10	78
005	1(1)	<10	—
009	51(27)	<10	54
010	51(51)	<10	<28
011	51(51)	<10	<28
<i>americium-241</i>			
001	4(4)	<0.20	<0.36
002	4(4)	<0.23	<0.38
003	5(5)	<0.07	<0.30
004	4(4)	<0.24	<0.29
009	4(4)	<0.1	<0.35
010	4(4)	<0.13	<0.3
011	4(4)	<0.25	<.38
<i>neptunium-237</i>			
001	4(4)	<0.03	<0.26
002	4(4)	<0.06	<0.19
003	5(5)	<0.04	<0.25
004	4(4)	<0.07	<0.28
009	4(4)	<0.13	<0.21
010	4(4)	<0.08	<0.19
011	4(4)	<0.05	<0.26

Table 2.3. Radioactivity concentrations in USEC NPDES outfall water samples for 1999 (continued)

NPDES outfall	Number of samples ^a	Concentration Minimum (pCi/L)	Maximum (pCi/L)
<i>plutonium-238</i>			
001	4(4)	<0.05	<0.21
002	4(4)	<0.04	<0.21
003	5(5)	< 0.14	<0.28
004	4(4)	<0.048	<0.1
009	4(4)	<0.054	<0.21
010	4(4)	<0.047	<0.15
011	4(4)	<0.055	<0.22
<i>plutonium-239/240</i>			
001	4(4)	<0.030	<0.14
002	4(4)	<0.058	<0.017
003	5(5)	<0.04	<0.28
004	4(4)	<0.13	<0.30
009	4(4)	<0.039	<0.22
010	4(4)	<0.047	<0.16
011	4(4)	<0.05	<0.14

^a Number in parentheses is the number of samples that were below the detection limit.

Table 2.4. DOE/PORTS NPDES permit summary for 1999

Effluent characteristics		Monitoring requirements		Discharge limitations	
Parameter	Units	Measurement frequency	Sampling type	Concentration	
				30-day	Daily
<i>Outfall 012 (X-2230M Holding Pond)</i>					
Flow rate	MGD	1/day	24-hour total ^a		
pH	SU	1/2 weeks	Grab		6.5-9.0
Total suspended solids	mg/L	1/2 weeks	Grab	30	45
Total oil and grease	mg/L	1/2 weeks	Grab	10	20
Total residual chlorine ^b	mg/L	1/2 weeks	Grab		
Phosphorus, Total	mg/L	1/2 weeks	Grab		
Hexavalent chromium	Fg/L	1/2 weeks	Grab		
Total chromium	Fg/L	1/2 weeks	Grab		
Trichloroethene	Fg/L	1.2 weeks	Grab		
PCBs ^c	Fg/L	1/quarter	Grab		
<i>Outfall 013 (X-2230N Holding Pond)</i>					
Flow rate	MGD	1/day	24-hour total ^a		
pH	SU	1/2 weeks	Grab		6.5-9.0
Total suspended solids	mg/L	1/2 weeks	Grab	30	45
Total oil and grease	mg/L	1/2 weeks	Grab	10	20
Total residual chlorine ^b	mg/L	1/2 weeks	Grab		
Phosphorus	mg/L	1/2 weeks	Grab		
Hexavalent chromium	Fg/L	1.2 weeks	Grab		
Total chromium	Fg/L	1/2 weeks	Grab		
PCBs ^c	Fg/L	1/quarter	Grab		
<i>Outfall 015 (X-624 Groundwater Treatment Facility)</i>					
Flow rate	MGD	Daily	24-hour total		
Trichloroethene	Fg/L	1/2 weeks	Grab	10	10
PCBs ^c	Fg/L	1/quarter	Grab		
<i>Outfall 608 (X-622 Groundwater Treatment Facility)</i>					
Flow rate	MGD	1/day	24-hour total ^a		
pH	SU	1/week	Grab		
Total zinc	Fg/L	1/2 weeks	Grab		
Trichloroethene	Fg/L	1/2 weeks	Grab		10
1,2-trans-dichloroethene	Fg/L	1/2 weeks	Grab	25	66

Table 2.4. DOE/PORTS NPDES permit summary for 1999 (continued)

Effluent characteristics		Monitoring requirements		Discharge limitations	
Parameter	Units	Measurement frequency	Sampling type	Concentration 30-day	Daily
<i>Outfall 610 (X-623 Groundwater Treatment Facility)</i>					
Flow rate	MGD	1/day	24-hour total		
pH	SU	1/week	Grab		
Total zinc	Fg/L	1/2 weeks	Grab		
Trichloroethene	Fg/L	1/2 weeks	Grab	10	10
1,2-trans-dichloroethene	Fg/L	1/2 weeks	Grab	25	66
<i>Outfall 611 (X-622T Groundwater Treatment Facility)</i>					
Flow rate	MGD	1/day	24-hour total		
Trichloroethene	Fg/L	1/2 weeks	Grab	10	10

^a Estimated.

^b Summer only.

^c No detectable PCBs without a numerical limit.

Table 2.5. 1999 DOE NPDES discharge and compliance rates

Parameter	NPDES compliance rate (%)	Number of samples ^d	Concentration/Loading			Units
			Minimum	Maximum	Average ^e	
<i>Outfall 012 (X-2230M Holding Pond)</i>						
Flow	a	249	0.000	15.113	0.452	MGD
pH	100	22	7.3	8.6	7.7	SU
Total suspended solids	100	22(1)	<2.0	23.00	8.36	mg/L
30 day average	100	12	1.65	13.31	7.22	mg/L
Oil and grease	100	22(22)	<5.0	<5.0	—	mg/L
30 day average	100	12	—	—	—	mg/L
Phosphorus	b	22(6)	<0.03	0.06	—	mg/L
Total residual chlorine	b	10(10)	<0.19	<0.19	—	mg/L
Hexavalent chromium	b	22(22)	<0.01	<0.01	—	Fg/L
Total chromium	b	22(22)	<13.5	<13.5	—	Fg/L
Trichloroethylene	b	22(20)	<1.0	1.00	—	Fg/L
PCBs	c	4(4)	<1.0	<1.0	—	Fg/L
<i>Outfall 013 (X-2230N Holding Pond)</i>						
Flow	a	249	0.005	6.825	0.259	MGD
pH	100	24	7.0	8.5	7.7	SU
Total suspended solids	100	24(0)	<2.0	10.00	5.25	mg/L
30 day average	100	12	2.50	9.03	5.29	mg/L
Oil and grease	100	24(24)	<5.0	<5.0	—	mg/L
30 day average	100	12	—	—	—	mg/L
Phosphorus	b	24(12)	<0.03	0.14	—	mg/L
Total residual chlorine	b	12(12)	<0.19	<0.19	—	mg/L
Hexavalent chromium	b	24(24)	<0.01	<0.01	—	Fg/L
Total chromium	b	24(24)	<13.5	<13.5	—	Fg/L
PCBs	c	4(4)	<1.0	<1.0	—	Fg/L
<i>Outfall 015 (X-624 Groundwater Treatment Facility)</i>						
Flow	a	365	0.000	0.100	0.008	MGD
Trichloroethylene	100	24(23)	<1.0	<1.0	—	Fg/L
30 day average	100	12	—	—	—	Fg/L
PCBs	c	4	<1.0	—	—	Fg/L
<i>Outfall 608 (X-622 Groundwater Treatment Facility)</i>						
Flow	a	365	0.010	0.030	0.020	MGD
pH	100	50	6.5	7.2	6.9	SU
Trichloroethylene	100	23(23)	<1.0	<1.0	—	Fg/L
1,2-trans-dichloroethylene	100	23(23)	<1.0	<1.0	—	Fg/L
30 day average	100	12	—	—	—	Fg/L
Total zinc	b	24(10)	<5.2	32	—	Fg/L

Table 2.5. 1999 DOE NPDES discharge and compliance rates (continued)

Parameter	NPDES compliance rate (%)	Number of samples ^d	Concentration/Loading			
			Minimum	Maximum	Average ^e	Units
<i>Outfall 610 (X-623 Groundwater Treatment Facility)</i>						
Flow	a	365	0.000	0.040	0.009	MGD
pH	100	50	6.7	8.7	7.3	SU
Trichloroethylene	100	25(25)	<1.0	<1.0	—	Fg/L
30 day average	100	12	—	—	—	Fg/L
1,2-trans-dichloroethylene	100	25(25)	<1.0	<1.0	—	Fg/L
30 day average	100	12	—	—	—	Fg/L
Total zinc	b	25(12)	<5.2	107	—	Fg/L
<i>Outfall 611 (X-622T Groundwater Treatment Facility)</i>						
Flow	a	365	0.014	0.310	0.030	MGD
Trichloroethylene	100	24(24)	<1.0	<1.0	—	Fg/L
30 day average	100	12	—	—	—	Fg/L

^a Flow does not have a numerical limit, no compliance rates are generated.

^b Monitoring only required.

^c The permit specifies no detectable PCBs in the effluent without setting a numerical limit of detection.

^d Number in parenthesis is the number of samples that were below the detection limit.

^e Averages were not calculated for parameters that had greater than 15% of the results below the detection limit.

Table 2.6. 1999 USEC NPDES discharge monitoring results

Parameter	Number of samples ^a	Concentration			Units
		Minimum	Maximum	Average ^b	
<i>Outfall 001 (X-230J7 East Holding Pond)</i>					
Flow	365	0.672	3.586	1.499	MGD
pH	52	6.8	8.3	7.7	SU
Total suspended solids	52(32)	<2.0	6.00	—	mg/L
Oil and grease	52(51)	<5.0	7.20	—	mg/L
Total residual chlorine	26(24)	0.00	0.05	—	mg/L
Phosphorus	12(10)	<0.03	0.16	—	mg/L
Hexavalent chromium	13(13)	<0.01	0.00	—	Fg/L
Chromium, total	13(13)	<13.5	0.00	—	Fg/L
Nickel	13(10)	<7.7	12.10	—	Fg/L
Zinc	13(2)	<24.7	78.40	—	Fg/L
PCBs	5(4)	<1.0	83.00	16.60	Fg/L
Trichloroethylene	51(51)	<1.0	0.00	—	Fg/L
<i>Outfall 002 (X-230K South Holding Pond)</i>					
Flow	349	0.000	2.426	0.420	MGD
pH	46	7.1	8.9	8.0	SU
Total suspended solids	44(2)	<2.0	26.6	10.4	mg/L
Phosphorus	12(0)	0.12	0.45	0.28	mg/L
Oil and grease	46(43)	<5.0	7.20	—	Fg/L
Hexavalent chromium	45(45)	<0.01	<0.01	—	Fg/L
Copper	46(9)	<3.8	19.40	—	Fg/L
Zinc	46(2)	<5.2	76.40	34.9	Fg/L
Trichloroethylene	46(46)	<1.0	<1.0	—	Fg/L
Chromium, total	12(12)	<13.5	<13.5	—	Fg/L
Iron	12(0)	175.00	2700	816	Fg/L
Manganese	12(0)	21.3	246	99.9	Fg/L
Phenol	7(7)	<0.05	<0.05	—	Fg/L
PCBs	2(2)	<1	<1	—	Fg/L
<i>Outfall 003 (X-6619 Sewage Treatment Plant)</i>					
Flow	365	0.181	0.788	0.402	MGD
pH	249	7.1	8.000	7.546	SU
Oil and grease	4(4)	<5.0	<5.0	—	mg/L
Phosphorus	12(0)	0.5	1.1	0.8	mg/L
Total residual chlorine	124(123)	<0.02	<0.02	—	mg/L
Total suspended solids	52(45)	<2	4.4	—	mg/L
Biochemical oxygen demand	53(53)	<5	<5	—	mg/L
Fecal coliform	26(1)	0.0	33.0	8.0	#/100 mL
Ammonia	26(18)	0.1	0.9	—	Fg/L
Nickel	52(18)	<7.0	20.1	9.81	Fg/L
Nitrate	26(0)	4.2	9.1	6.0	Fg/L
Arsenic	26(24)	<29.4	37.0	—	Fg/L
Cadmium, total	26(24)	<2.5	3.3	—	Fg/L
Hexavalent chromium	26(26)	<0.01	0.0	—	Fg/L
Copper	26(0)	30.6	271.0	66.7	Fg/L

Table 2.6. 1999 USEC NPDES discharge monitoring results (continued)

Parameter	Number of samples ^a	Concentrations			Units
		Minimum	Maximum	Average ^b	
<i>Outfall 003 (X-6619 Sewage Treatment Plant) (continued)</i>					
Iron	26(1)	<5.8	175.0	54.3	Fg/L
Silver	26(3)	<4.5	21.7	14.9	Fg/L
Zinc	26(0)	6.7	140.0	50.7	Fg/L
Mercury	25(25)	<1.0	0.0	—	Fg/L
PCBs	4(4)	<1.0	<1.0	—	Fg/L
<i>Outfall 004(X-616 Liquid Effluent Control Facility)</i>					
Flow	365	0.300	1.123	0.807	MGD
pH	103	6.8	7.9	7.2	SU
Total suspended solids	49(29)	<2.0	7.2	—	mg/L
Oil and grease	48(41)	<5.0	9.3	—	mg/L
Total dissolved solids	52(0)	2401	3469	2865	mg/L
Chromium, total	48(46)	0.0	15.0	—	Fg/L
Copper	52(0)	14.0	33.7	21.6	Fg/L
Iron	52(0)	93.0	351	186	Fg/L
Zinc	51(0)	16.2	276	53.4	Fg/L
Hexavalent chromium (dissolved)	48(48)	<0.01	<0.01	—	Fg/L
Chloroform	48(48)	<1.0	<1.0	—	Fg/L
Trichloroethylene	48(48)	<1.0	<1.0	—	Fg/L
Mercury	22(22)	<1	<1	—	Fg/L
PCBs	4(4)	<1	<1	—	Fg/L
<i>Outfall 005 (X-611B Lime Sludge Lagoon)</i>					
Flow	365	—	0.001	—	MGD
pH	1(0)	—	8.4	—	SU
Total suspended solids	1(0)	—	19.2	—	mg/L
PCBs	1(1)	—	0.0	—	Fg/L
<i>Outfall 009 (X-230L North Holding Pond)</i>					
Flow	296	0.000	3.549	0.525	MGD
pH	52	7.3	9.0	7.8	SU
Total residual chlorine	23(19)	<0.012	0.015	—	mg/L
Total suspended solids	52(9)	<2.0	54	—	mg/L
Oil and grease	52(52)	<5.0	<5.0	—	mg/L
Phosphorus	52(36)	<0.03	0.430	—	mg/L
Hexavalent chromium	52(52)	<0.01	<0.01	—	Fg/L
Chromium, total	52(51)	<13.5	0	—	Fg/L
Zinc	52(1)	<5.2	87.5	40.1	Fg/L

Table 2.6. 1999 USEC NPDES discharge monitoring results (continued)

Parameter	Number of samples ^a	Concentration			Units
		Minimum	Maximum	Average ^b	
<i>Outfall 010 (X-230J5 Northwest Holding Pond)</i>					
Flow	365	0.085	0.770	0.263	MGD
pH	26	7.0	7.9	7.6	SU
Total suspended solids	26(2)	<2	120	10.8	mg/L
Oil and grease	26(24)	<5	9.8	—	mg/L
Phosphorus	26(16)	<0.03	0.10	—	mg/L
Hexavalent chromium	26(26)	<0.01	<0.01	—	Fg/L
Chromium, total	26(25)	<13.5	28.2	—	Fg/L
Zinc	26(1)	<5.2	95.0	48.0	Fg/L
PCBs	4(4)	<1	<1	—	Fg/L
<i>Outfall 011 (X-230J6 Northeast Holding Pond)</i>					
Flow	310	0	0.338	0.045	MGD
Temperature	28	4.5	27.1	16.2	°C
pH	28	7.1	8.2	7.6	SU
Total suspended solids	24(13)	<2.0	7.6	—	mg/L
Oil and grease	25(24)	<5	3.6	—	mg/L
Phosphorus	24(12)	<0.03	0.2	—	mg/L
Hexavalent chromium	24(24)	<0.01	0.0	—	Fg/L
Total chromium	24(23)	<13.5	15.0	—	Fg/L
Zinc, total	26(1)	<5.2	190.0	57.5	Fg/L
PCBs	4(4)	<1.0	<1.00	—	Fg/L
<i>Outfall 602 (X-621 Coal Pile Runoff Treatment Facility)</i>					
Flow	365	0.000	0.096	0.047	MGD
pH	51	8.4	9.9	9.2	SU
Total suspended solids	26(3)	<2.0	21	4.8	mg/L
Iron	26(0)	9	972	344	Fg/L
Manganese	26(0)	4	113	31.7	Fg/L
<i>Outfall 604 (X-700 Biodenitrification Facility)</i>					
Flow	365	0.000	0.054	0.028	MGD
pH	25	7.4	8.6	7.9	SU
Nitrate	25(16)	<0.1	19.0	—	mg/L
Copper	26(0)	7.5	64.7	22.6	Fg/L
Iron	25(0)	29.1	705	125	Fg/L
Nickel	25(14)	<7.7	24.0	—	Fg/L
Zinc	25(1)	<5.2	126	37.5	Fg/L
<i>Outfall 605 (X-705 Decontamination Microfiltration System)</i>					
Flow	365	0.000	0.025	0.006	MGD
pH	90	7.6	9.5	8.3	SU
Total suspended solids	22(22)	<2.0	<2.0	—	mg/L
Oil and grease	22(19)	<5	10.7	—	mg/L
Nitrate	24(0)	0.280	170	44.8	mg/L
Sulfate	24(0)	70	418	127	mg/L

Table 2.6. 1999 USEC NPDES discharge monitoring results (continued)

Parameter	Number of samples ^a	Concentration			Units
		Minimum	Maximum	Average ^b	
<i>Outfall 605 (X-705 Decontamination Microfiltration System) (continued)</i>					
Ammonia	11(4)	<0.1	5.7	—	mg/L
Nitrite	12(3)	<0.1	2.4	—	mg/L
Nitrogen, Kjeldahl, total	11(0)	0.20	6.4	1.3	mg/L
Hexavalent chromium	23(21)	<0.01	0.02	—	Fg/L
Total chromium	22(22)	<13.5	<13.5	—	Fg/L
Copper	24(1)	<3.8	273	51.3	Fg/L
Iron	24(3)	<5.8	198	43.2	Fg/L
Nickel	24(3)	<7.0	370	69.3	Fg/L
Zinc	24(4)	<5.2	42.0	—	Fg/L
Trichloroethylene	22(22)	<1.0	<1.0	—	Fg/L
<i>Outfall 902 (downstream of outfall 001)</i>					
Temperature	104	5.0	30.0	19.4	°C
<i>Outfall 903 (downstream of outfall 002)</i>					
Temperature	104	1.0	29.0	14.9	°C

^a Number in parenthesis is the number of samples that were below the detection limit.

^b Averages were not calculated for parameters which had greater than 15% of the results below the detection limit. For outfalls with less than 15% of the results below the detection limit, any result below the detection limit was assigned a value at the detection limit for calculating the average for the parameter.

**Table 2.7. USEC ambient air monitoring program alpha, beta high volume
air samplers and gaseous fluoride – 1999**

Sampling Location	Parameter ^a	No. of measurements	Minimum	Maximum	Average	Background (A37)
<i>On-site air samplers</i>						
A10	alpha	52	0.002	0.016	0.006	0.005
	beta	52	0.017	0.116	0.052	0.048
	fluorides	52	0.03	0.10	0.06	0.08
A36	fluorides	52	0.07	0.58	0.19	0.08
A40	fluorides	51	0.00	0.34	0.13	0.08
<i>Off-site air samplers</i>						
A3	alpha	52	0.001	0.014	0.005	0.005
	beta	52	0.015	0.102	0.045	0.048
	fluorides	49	0.04	0.44	0.10	0.08
A6	fluorides	52	0.04	0.18	0.09	0.08
A8	alpha	52	0.001	0.011	0.004	0.005
	beta	52	0.018	0.114	0.051	0.048
	fluorides	46	0.04	0.17	0.08	0.08
A9	alpha	52	0.001	0.011	0.005	0.005
	beta	52	0.030	0.096	0.054	0.048
	fluorides	52	0.04	0.15	0.07	0.08
A12 ^b	alpha	52	0.003	0.255	0.034	0.005
	beta	52	0.008	0.462	0.115	0.048
	fluorides	52	0.00	0.27	0.09	0.08
A15	alpha	52	0.001	0.017	0.005	0.005
	beta	52	0.030	0.129	0.052	0.048
	fluorides	52	0.04	0.46	0.11	0.08
A23	alpha	52	0.002	0.012	0.005	0.005
	beta	52	0.027	0.126	0.048	0.048
	fluorides	48	0.00	0.21	0.09	0.08
A24	fluorides	52	0.00	0.28	0.12	0.08
A28	alpha	13	0.001	0.016	0.004	0.005
	beta	13	0.022	0.071	0.042	0.048
	fluorides	52	0.07	0.23	0.12	0.08
A29 ^b	alpha	9	0.000	0.007	0.002	0.005
	beta	9	0.000	0.045	0.026	0.048
	fluorides	52	0.00	0.18	0.06	0.08
A37 (background)	alpha	46	0.001	0.012	0.005	-
	beta	46	0.013	0.097	0.048	-
	fluorides	52	0.05	0.26	0.08	-
A41	alpha	52	0.001	0.015	0.005	0.005
	beta	52	0.025	0.146	0.053	0.048
	fluorides	50	0.00	0.13	0.06	0.08

^a Alpha and beta measured in pCi/m³. Fluorides measured in Fg/m³

^b Measurement of fluorides at locations A12 and A29 is based on theoretical air flow.

**Table 2.8. USEC ambient air monitoring program
alpha, beta low volume air samplers – 1999**

Sampling Location	Parameter ^a	No. of measurements	Minimum	Maximum	Average	Background (A37)
<i>On-site air samplers</i>						
A10	alpha	12	0.001	0.007	0.002	0.002
	beta	12	0.012	0.067	0.020	0.023
A36	alpha	12	0.001	0.006	0.003	0.002
	beta	12	0.012	0.085	0.028	0.023
A40	alpha	12	0.001	0.007	0.002	0.002
	beta	12	0.002	0.097	0.026	0.023
<i>Off-site air samplers</i>						
A3	alpha	12	0.000	0.022	0.003	0.002
	beta	12	0.007	0.055	0.021	0.023
A6	alpha	12	0.001	0.003	0.002	0.002
	beta	12	0.013	0.059	0.025	0.023
A8	alpha	12	0.001	0.009	0.003	0.002
	beta	12	0.013	0.085	0.025	0.023
A9	alpha	12	0.000	0.010	0.002	0.002
	beta	12	0.013	0.075	0.026	0.023
A12 ^b	alpha	12	0.001	0.007	0.002	0.002
	beta	12	0.006	0.084	0.025	0.023
A15	alpha	12	0.001	0.003	0.002	0.002
	beta	12	0.010	0.043	0.023	0.023
A23	alpha	12	0.001	0.004	0.002	0.002
	beta	12	0.012	0.046	0.022	0.023
A24	alpha	12	0.001	0.009	0.003	0.002
	beta	12	0.011	0.157	0.042	0.023
A28	alpha	12	0.001	0.008	0.003	0.002
	beta	12	0.010	0.079	0.028	0.023
A29 ^b	alpha	9	0.000	0.003	0.001	0.002
	beta	9	0.003	0.026	0.018	0.023
A37	alpha	12	0.001	0.008	0.002	-
(background)	beta	12	0.012	0.067	0.023	-
A41	alpha	12	0.000	0.002	0.001	0.002
	beta	12	0.004	0.027	0.014	0.023

^a Alpha and beta measured in pCi/m³.

^b Measurement of alpha and beta at locations A12 and A29 calculated based on a flow rate of 9 ft³/hr. Neither sampler was equipped with a gas meter in 1999.

Table 2.9. USEC direct radiation monitoring program quarterly external gamma radiation measurements (mrem) – 1999

FIRST QUARTER (hours in field 1992)						SECOND QUARTER (hours in field 2328)					
Location	#	Deep	Eye	Shallow	Neutron	#	Deep	Eye	Shallow	Neutron	
A3	001	19	20	29	0	001	27	27	27	0	
A6	002	18	19	26	0	002	21	21	25	0	
A8	003	21	22	31	0	003	23	23	23	0	
A9	004	19	19	22	0	004	21	21	23	0	
A12	005	21	21	23	0	005	21	21	21	0	
A15	006	21	21	24	0	006	23	23	23	0	
A23	007	19	19	20	0	007	21	22	34	0	
A24	008	19	19	20	0	008	21	22	22	0	
A28	009	19	19	20	0	009	23	23	25	0	
A29	010	17	17	19	0	010	21	21	21	0	
A35	011	22	22	23	0	011	23	23	25	0	
A36	012	19	19	22	0	012	23	23	25	0	
A40	013	16	18	26	0	013	18	18	20	0	
518	014	20	20	22	0	014	21	21	24	0	
737	015	19	19	22	0	015	22	22	26	0	
862	016	19	24	31	0	016	21	25	32	0	
874	017	136	136	136	29	017	140	140	147	30	
906	018	18	18	19	0	018	19	19	23	0	
933	019	19	19	20	0	020	19	22	23	0	
1404A	020	19	20	32	0	019	22	22	22	0	
A37	021	20	20	21	0	021	22	22	26	0	

Table 2.9. USEC direct radiation monitoring program quarterly external gamma radiation measurements (mrem) – 1999 (continued)

Location	#	THIRD QUARTER (hours in field 2064)				FOURTH QUARTER (hours in field 2352)				
		Deep	Eye	Shallow	Neutron	#	Deep	Eye	Shallow	Neutron
A3	001	20	20	22	0	001	26	26	28	0
A6	002	18	18	19	0	002	23	23	27	0
A8	003	21	21	21	0	003	27	27	27	0
A9	004	19	19	19	0	004	23	23	25	0
A12	005	18	18	18	0	005	24	24	28	0
A15	006	20	20	20	0	006	26	26	27	0
A23	007	19	19	22	0	007	24	24	24	0
A24	008	19	19	22	0	008	24	28	32	0
A28	009	20	20	22	0	009	25	25	25	0
A29	010	18	18	21	0	010	23	23	23	0
A35	011	19	19	19	0	011	25	25	25	0
A36	012	20	20	20	0	012	26	26	30	0
A40	013	15	15	15	0	013	20	21	37	0
518	014	16	17	17	0	014	24	24	25	0
737	015	16	19	21	0	015	24	24	36	0
862	016	19	19	19	0	016	25	25	26	0
874	017	130	130	132	28	017	168	168	173	39
906	018	15	17	17	0	018	22	22	24	0
933	019	19	21	22	0	020	33	33	37	0
1404A	020	21	21	21	0	019	29	29	29	0
A37 ^a	021	-	-	-	-	021	31	31	31	0

^a No data for third quarter. Thermoluminescent dosimeter could not be read by laboratory.

Table 2.10. USEC direct radiation monitoring program summary of quarterly external gamma radiation levels (Frem/hr) – 1999

Location	First quarter	Second quarter	Third quarter	Fourth quarter
<i>On-site (excluding 874)</i>				
518	10.0	9.0	7.8	10.2
862	9.5	9.0	9.2	10.6
906	9.0	8.2	7.3	9.4
933	9.5	8.2	9.2	14.0
1404A	9.5	9.5	10.2	12.3
A35	11.0	9.9	9.2	10.6
A40	8.0	7.7	7.3	8.5
A36	9.5	9.9	9.7	11.1
Mean	9.5	8.9	8.7	10.8
Standard Deviation	0.79	0.77	1.06	1.60
874	68.3	60.1	63.0	71.4
<i>Reservation Boundary</i>				
A3	9.5	11.6	9.7	11.1
A8	10.5	9.9	10.2	11.5
A9	9.5	9.0	9.2	9.8
A12	10.5	9.0	8.7	10.2
A15	10.5	9.9	9.7	11.1
A23	9.5	9.0	9.2	10.2
A24	9.5	9.0	9.2	10.2
A29	8.5	9.0	8.7	9.8
Mean	9.8	9.6	9.3	10.5
Standard Deviation	0.66	0.9	0.5	0.6
<i>Offsite</i>				
A6 (Piketon)	9.0	9.0	8.7	9.8
A28 (Camp Creek)	9.5	9.9	9.7	10.6

**Table 2.11. USEC surface water monitoring program
results of radiological monitoring – 1999**

Location		No. of samples ^a	Minimum	Maximum	Average ^b	DCG ^c
<i>gross alpha (pCi/L)</i>						
Scioto River	RW-1	53(42)	<2	10	—	NA
	RW-6	53(39)	<2	12	—	NA
Little Beaver Creek	RW-7	12(4)	<4	11	—	NA
	RW-8	53(30)	<3	24	—	NA
Big Beaver Creek	RW-12	12(12)	<4	<6	—	NA
	RW-5	12(9)	<4	6	—	NA
Big Run Creek	RW-13	12(9)	<4	31	—	NA
	RW-2	11(10)	<4	9	—	NA
Background creeks	RW-3	11(10)	<5	12	—	NA
	RW-33	12(12)	<4	<6	—	NA
Background creeks	RW-10 N	12(11)	<4	8	—	NA
	RW-10 E	12(10)	<3	6	—	NA
Background creeks	RW-10 S	12(11)	<3	11	—	NA
	RW-10 W	12(12)	<3	<7	—	NA
<i>gross beta (pCi/L)</i>						
Scioto River	RW-1	53(23)	<8	32	—	NA
	RW-6	53(22)	<7	40	—	NA
Little Beaver Creek	RW-7	12(5)	<7	29	—	NA
	RW-8	53(12)	<7	52	—	NA
Big Beaver Creek	RW-12	12(8)	<6	16	—	NA
	RW-5	12(7)	<7	14	—	NA
Big Run Creek	RW-13	12(4)	<7	62	—	NA
	RW-2	11(8)	<8	27	—	NA
Background creeks	RW-3	11(8)	<8	17	—	NA
	RW-33	12(5)	<10	28	—	NA
Background creeks	RW-10 N	12(6)	<6	20	—	NA
	RW-10 E	12(7)	<6	18	—	NA
Background creeks	RW-10 S	12(6)	<7	24	—	NA
	RW-10 W	12(9)	<7	16	—	NA
<i>total uranium (Fg/L)</i>						
Scioto River	RW-1	53(2)	<1.0	2.1	<1.6	NA
	RW-6	53(2)	<1.0	2.3	<1.6	NA
Little Beaver Creek	RW-7	12(1)	<1.0	2.3	<1.9	NA
	RW-8	53(0)	1.0	7.7	1.8	NA
Big Beaver Creek	RW-12	12(12)	<1.0	<1.0	—	NA
	RW-5	12(9)	<1.0	1.8	—	NA
Big Run Creek	RW-13	12(6)	<1.0	2.5	—	NA
	RW-2	11(7)	<1.0	1.5	—	NA
Big Run Creek	RW-3	11(2)	<1.0	3.2	<2.0	NA
	RW-33	12(12)	<1.0	<1.0	—	NA
Background creeks	RW-10 N	12(11)	<1.0	1.2	—	NA
	RW-10 E	12(11)	<1.0	2.0	—	NA
Background creeks	RW-10 S	12(11)	<1.0	1.9	—	NA
	RW-10 W	12(12)	<1.0	<1.0	—	NA

**Table 2.11. USEC surface water monitoring program results
of radiological monitoring – 1999 (continued)**

Location		No. of samples ^a	Minimum	Maximum	Average ^b	DCG ^c
<i>technetium-99 (pCi/L)</i>						
Scioto River	RW-1	53(53)	<10	<28	—	100,000
	RW-6	53(52)	<10	28	—	100,000
Little Beaver Creek	RW-7	12(12)	<11	<28	—	100,000
	RW-8	53(53)	<10	<28	—	100,000
Big Beaver Creek	RW-12	12(12)	<10	<28	—	100,000
	RW-5	12(12)	<10	<28	—	100,000
	RW-13	12(12)	<10	<28	—	100,000
	RW-2	11(11)	<11	<28	—	100,000
Big Run Creek	RW-3	11(11)	<11	<28	—	100,000
	RW-33	12(12)	<10	<28	—	100,000
	RW-10 N	12(12)	<10	<28	—	100,000
Background creeks	RW-10 E	12(12)	<10	<28	—	100,000
	RW-10 S	12(12)	<10	<28	—	100,000
	RW-10 W	12(12)	<10	<28	—	100,000

^a The number in parentheses is the number of samples that were below the detection limit.

^b The average is not calculated for locations that had greater than 15% of the results below the detection limit.

^c Derived concentration guide. A DCG is not available for gross alpha, gross beta, or total uranium.

Table 2.12. USEC sediment monitoring program monitoring results – 1999

Analyte	Units	Spring	Fall	Spring	Fall
<i>Scioto River</i>					
<i>RM-6</i>		<i>Upstream @ Piketon</i>		<i>RM-1</i>	
<i>Downstream @ Lucasville</i>					
Aluminum	mg/kg	3,510	2,700	9,310	2,330
Antimony	mg/kg	< 3.9	< 3.95	< 3.9	< 38.9
Arsenic	mg/kg	10.0	3.37	19.9	< 28.1
Barium	mg/kg	36.9	33.2	82.3	48.1
Beryllium	mg/kg	0.26	0.232	0.58	< 0.191
Cadmium	mg/kg	0.37	0.34	0.60	<2.19
Calcium	mg/kg	17,800	13,000	7,160	45,200
Chromium	mg/kg	6.3	5.21	11.5	<11.7
Copper	mg/kg	7.8	9.71	14.1	5.33
Iron	mg/kg	8,500	7,550	16,400	6,680
Lead	mg/kg	6.4	10.3	11.9	< 28.1
Magnesium	mg/kg	6,600	4,430	4,550	5,900
Manganese	mg/kg	151	173	298	271
Mercury	mg/kg	0.025	0.026	0.024	0.025
Nickel	mg/kg	8.7	8.25	16.2	8.47
Potassium	mg/kg	538	376	1,060	< 379
Selenium	mg/kg	4.4	< 3.27	8.7	< 32.3
Silicon	mg/kg	284	176	395	196
Silver	mg/kg	5.3	3.50	2.4	4.95
Thallium	mg/kg	8.3	< 3.79	11.2	< 37.3
Zinc	mg/kg	47.8	39.2	57.2	88.1
Total PCBs	Fg/g	< 0.5	< 0.5	< 0.5	< 0.5
Gross Alpha Activity	pCi/g	< 6	3	< 6	7
Gross Beta Activity	pCi/g	< 17	< 10	19	< 10
Technetium	pCi/g	< 0.2	< 0.2	< 0.2	< 0.2
Uranium	Fg/g	4.6	1.8	4.4	2.4
<i>Little Beaver Creek</i>					
<i>RM-12</i>		<i>Upstream</i>		<i>RM-11</i>	
<i>X-230J7 Discharge</i>					
Aluminum	mg/kg	3,120	3,500	5,660	2,530
Antimony	mg/kg	< 3.8	< 3.66	4.4	< 3.73
Arsenic	mg/kg	17.2	2.91	30.0	6.40
Barium	mg/kg	26.5	36.2	46.4	23.4
Beryllium	mg/kg	0.30	0.467	0.53	0.485
Cadmium	mg/kg	0.26	0.598	3.0	0.571
Calcium	mg/kg	431	348	5,400	690
Chromium	mg/kg	6.3	8.62	37.0	9.85
Copper	mg/kg	6.2	7.58	28.3	9.27
Iron	mg/kg	10,300	12,700	20,500	15,100

Table 2.12. USEC sediment monitoring program monitoring results – 1999 (continued)

Analyte	Units	Spring	Fall	Spring	Fall
<i>Little Beaver Creek</i>					
		<i>RM-12 Upstream</i>		<i>RM-11 X-230J7 Discharge</i>	
Lead	mg/kg	8.2	10.2	25.7	12.5
Magnesium	mg/kg	510	728	3,410	550
Manganese	mg/kg	187	182	734	275
Mercury	mg/kg	< 0.022	< 0.025	0.811	< 0.024
Nickel	mg/kg	5.1	8.13	50.8	7.33
Potassium	mg/kg	498	474	404	232
Selenium	mg/kg	9.5	8.70	15.4	10.9
Silicon	mg/kg	303	244	494	142
Silver	mg/kg	1.9	2.07	5.7	3.53
Thallium	mg/kg	5.3	< 3.51	9.1	< 35.7
Zinc	mg/kg	27.5	24.4	206	49.1
Total PCBs	Fg/g	< 0.5	< 0.5	2.1	< 0.5
Gross Alpha Activity	pCi/g	< 6	8	24	6
Gross Beta Activity	pCi/g	< 16	< 12	43	< 12
Technetium	pCi/g	< 0.2	< 0.2	29.1	0.9
Uranium	Fg/g	3.4	2.9	10.6	3.6
<i>Little Beaver Creek</i>					
		<i>RM-8 Downstream @ PL</i>		<i>RM-7 Downstream @ Confluence</i>	
Aluminum	mg/kg	3,500	2,750	5,780	3,440
Antimony	mg/kg	7.7	< 3.83	< 4	< 34.5
Arsenic	mg/kg	57.9	3.67	18.2	< 24.9
Barium	mg/kg	29.1	27.1	49.2	73.3
Beryllium	mg/kg	0.57	0.404	0.44	0.525
Cadmium	mg/kg	1.5	1.20	0.69	< 1.95
Calcium	mg/kg	2,020	1,620	5,620	63,900
Chromium	mg/kg	17.8	10.7	19.2	2,150
Copper	mg/kg	10.0	12.7	11.2	32.1
Iron	mg/kg	34,500	12,600	14,800	21,200
Lead	mg/kg	11.3	9.66	8.2	< 24.9
Magnesium	mg/kg	1,210	1,130	2,060	2,650
Manganese	mg/kg	355	437	353	568
Mercury	mg/kg	0.038	< 0.024	0.695	0.100
Nickel	mg/kg	23.6	21.6	20.6	13.1
Potassium	mg/kg	452	310	712	< 336
Selenium	mg/kg	29.0	7.73	8.7	< 28.6
Silicon	mg/kg	322	379	276	589
Silver	mg/kg	10.0	2.78	2.8	5.29
Thallium	mg/kg	18.0	< 3.67	16.2	< 33.1
Zinc	mg/kg	109	134	56.2	194

Table 2.12. USEC sediment monitoring program monitoring results – 1999 (continued)

Analyte	Units	Spring	Fall	Spring	Fall
		<i>Little Beaver Creek</i>			
		<i>RM-8</i>	<i>Downstream @ PL</i>	<i>RM-7</i>	<i>Downstream @ Confluence</i>
Total PCBs	Fg/g	0.29	< 0.5	0.68	< 0.5
Gross Alpha Activity	pCi/g	22	22	7	11
Gross Beta Activity	pCi/g	20	23	66	21
Technetium	pCi/g	9.3	8.2	48.7	7.5
Uranium	Fg/g	6.7	5.8	5.5	4.5
<i>Big Beaver Creek</i>					
		<i>RM-5</i>	<i>Upstream</i>	<i>RM-13</i>	<i>Downstream</i>
Aluminum	mg/kg	3,540	2,960	3,100	2,910
Antimony	mg/kg	< 4.1	< 3.93	< 4.1	< 4.02
Arsenic	mg/kg	10.6	2.83	8.3	< 2.89
Barium	mg/kg	35.2	45.6	31.9	33.8
Beryllium	mg/kg	0.33	0.355	0.28	0.366
Cadmium	mg/kg	0.60	0.50	< 0.23	0.926
Calcium	mg/kg	2,940	3,730	2,100	4,340
Chromium	mg/kg	5.8	5.98	5.0	6.91
Copper	mg/kg	7.4	9.12	4.6	10.3
Iron	mg/kg	8,540	9,950	6,830	9,050
Lead	mg/kg	7.3	13.6	8.5	9.49
Magnesium	mg/kg	1,800	2,110	1,380	2,730
Manganese	mg/kg	281	461	252	243
Mercury	mg/kg	< 0.025	< 0.022	< 0.024	0.028
Nickel	mg/kg	9.9	10.2	7.0	14.9
Potassium	mg/kg	537	482	479	404
Selenium	mg/kg	-	6.47	4.4	6.73
Silicon	mg/kg	347	142	203	-
Silver	mg/kg	2.1	2.60	1.3	2.58
Thallium	mg/kg	6.3	< 3.77	< 3.9	< 3.85
Zinc	mg/kg	36.1	39.3	35.7	70.6
Total PCBs	Fg/g	< 0.5	< 0.5	< 0.5	< 0.5
Gross Alpha Activity	pCi/g	7	9	< 6	8
Gross Beta Activity	pCi/g	15	< 12	< 17	14
Technetium	pCi/g	0.2	< 0.2	1.1	6.3
Uranium	Fg/g	3.2	3.0	3.7	3.9

Table 2.12. USEC sediment monitoring program monitoring results – 1999 (continued)

Analyte	Units	Spring	Fall	Spring	Fall
<i>Big Run Creek</i>					
		<i>RM-33</i> <i>Upstream</i>		<i>RM-3</i> <i>Downstream</i>	
Aluminum	mg/kg	3,820	2,380	3,800	3,560
Antimony	mg/kg	< 4	< 3.88	< 4.1	< 3.68
Arsenic	mg/kg	22.8	4.37	28.4	5.29
Barium	mg/kg	34.9	26.9	28.6	44.8
Beryllium	mg/kg	0.42	0.308	0.62	0.459
Cadmium	mg/kg	0.72	0.569	0.76	0.641
Calcium	mg/kg	574	302	1,520	1,310
Chromium	mg/kg	7.1	4.54	11.6	6.31
Copper	mg/kg	6.8	6.73	8.6	7.75
Iron	mg/kg	14,100	10,700	16,400	10,100
Lead	mg/kg	11.2	9.00	13.2	10.7
Magnesium	mg/kg	603	400	976	940
Manganese	mg/kg	193	86.1	160	473
Mercury	mg/kg	< 0.022	< 0.024	< 0.024	< 0.025
Nickel	mg/kg	8.8	11.1	19.6	9.80
Potassium	mg/kg	487	321	301	283
Selenium	mg/kg	14.0	7.27	12.6	7.52
Silicon	mg/kg	337	180	99.2	334
Silver	mg/kg	3.0	1.95	3.6	1.45
Thallium	mg/kg	6.7	< 3.72	< 3.9	< 3.52
Zinc	mg/kg	37.9	40.1	61.9	53.5
Total PCBs	Fg/g	< 0.5	< 0.5	< 0.5	< 0.5
Gross Alpha Activity	pCi/g	< 6	4	8	13
Gross Beta Activity	pCi/g	< 16	14	< 17	< 11
Technetium	pCi/g	< 0.2	< 0.2	0.6	0.9
Uranium	Fg/g	3.9	4.8	4.7	5.0
<i>RM-2</i> <i>Downstream @ Wakefield</i>					
Aluminum	mg/kg	2,880	3,770		
Antimony	mg/kg	< 4	< 4.03		
Arsenic	mg/kg	15.8	5.48		
Barium	mg/kg	27.9	32.9		
Beryllium	mg/kg	0.39	0.451		
Cadmium	mg/kg	0.77	1.05		
Calcium	mg/kg	2,140	8,550		
Chromium	mg/kg	4.8	8.92		
Copper	mg/kg	7.8	11.8		
Iron	mg/kg	9,750	16,200		
Lead	mg/kg	8.7	12.7		

Table 2.12. USEC sediment monitoring program monitoring results – 1999 (continued)

Analyte	Units	Spring	Fall	Spring	Fall
<i>Big Run Creek</i>					
<i>RM-2</i>					
<i>Downstream @ Wakefield</i>					
Magnesium	mg/kg	1,440	4,550		
Manganese	mg/kg	194	249		
Mercury	mg/kg	< 0.025	< 0.024		
Nickel	mg/kg	16.5	16.3		
Potassium	mg/kg	457	467		
Selenium	mg/kg	6.6	7.37		
Silicon	mg/kg	265	289		
Silver	mg/kg	2.6	5.49		
Thallium	mg/kg	< 3.8	< 3.86		
Zinc	mg/kg	65.9	70.7		
Total PCBs	Fg/g	< 0.5	< 0.5		
Gross Alpha Activity	pCi/g	6	7		
Gross Beta Activity	pCi/g	< 17	< 12		
Technetium	pCi/g	< 0.2	< 0.2		
Uranium	Fg/g	4.2	3.9		
<i>West Outfalls</i>					
<i>RM-9</i>					
<i>Outfall 012</i>					
<i>RM-10</i>					
<i>Outfall 010/013</i>					
Aluminum	mg/kg	2,450	3,330	5,620	2,630
Antimony	mg/kg	< 4.1	< 4.06	< 4.1	< 3.41
Arsenic	mg/kg	6.6	< 2.92	8.0	< 2.46
Barium	mg/kg	19.1	31.6	53.6	39.0
Beryllium	mg/kg	0.15	0.277	0.50	0.446
Cadmium	mg/kg	0.42	0.922	0.44	0.758
Calcium	mg/kg	1,360	1,640	764	1,650
Chromium	mg/kg	3.0	4.43	8.4	5.67
Copper	mg/kg	5.2	8.66	11.0	7.59
Iron	mg/kg	4,440	11,000	10,500	12,900
Lead	mg/kg	< 2.9	8.25	6.0	11.5
Magnesium	mg/kg	812	892	802	1,120
Manganese	mg/kg	515	347	123	347
Mercury	mg/kg	< 0.024	< 0.025	0.027	< 0.025
Nickel	mg/kg	5.5	16.2	9.2	8.33
Potassium	mg/kg	424	459	262	218
Selenium	mg/kg	< 3.4	< 3.36	6.8	9.93
Silicon	mg/kg	230	206	723	303
Silver	mg/kg	0.47	1.94	< 0.41	2.98
Thallium	mg/kg	< 3.9	< 3.89	7.1	< 3.27
Zinc	mg/kg	104	81.1	51.4	67.9
Total PCBs	Fg/g	< 0.5	< 0.5	< 0.5	< 0.5

Table 2.12. USEC sediment monitoring program monitoring results – 1999 (continued)

Analyte	Units	Spring	Fall	Spring	Fall
<i>West Outfalls</i>					
<i>RM-9</i>		<i>Outfall 012</i>		<i>RM-10</i>	
<i>Outfall 010/013</i>					
Gross Alpha Activity	pCi/g	15	10	< 5	8
Gross Beta Activity	pCi/g	36	< 11	< 9	< 11
Technetium	pCi/g	< 0.2	< 0.2	< 0.2	0.3
Uranium	Fg/g	3.9	6.2	3.1	3.0
<i>Background Creeks</i>					
<i>RM-10N</i>		<i>North Background</i>		<i>RM-10E</i>	
<i>East Background</i>					
Aluminum	mg/kg	4,740	4,180	1,710	1,800
Antimony	mg/kg	< 3.9	< 3.99	4.1	< 3.85
Arsenic	mg/kg	24.7	< 2.87	6.6	< 2.78
Barium	mg/kg	81.0	42.7	24.9	27.2
Beryllium	mg/kg	0.58	0.414	0.22	0.263
Cadmium	mg/kg	0.87	0.766	0.27	0.303
Calcium	mg/kg	1,550	2,990	388	637
Chromium	mg/kg	9.3	6.27	3.5	4.83
Copper	mg/kg	13.6	7.42	2.6	3.01
Iron	mg/kg	18,200	11,000	5,230	6,690
Lead	mg/kg	10.6	7.78	6.1	2.92
Magnesium	mg/kg	1,410	2,090	198	406
Manganese	mg/kg	298	301	172	269
Mercury	mg/kg	< 0.02	< 0.025	< 0.02	< 0.025
Nickel	mg/kg	20.6	15.4	3.2	5.10
Potassium	mg/kg	651	436	214	231
Selenium	mg/kg	17.1	5.26	< 3.4	< 3.19
Silicon	mg/kg	264	307	165	302
Silver	mg/kg	3.8	1.78	0.81	0.935
Thallium	mg/kg	9.7	< 3.82	6.2	< 3.69
Zinc	mg/kg	57.2	44.1	14.0	< 23.2
Total PCBs	Fg/g	< 0.5	< 0.5	< 0.5	< 0.5
Gross Alpha Activity	pCi/g	6	6	< 6	< 6
Gross Beta Activity	pCi/g	< 16	< 10	< 17	< 8
Technetium	pCi/g	< 0.2	< 0.2	< 0.2	< 0.1
Uranium	Fg/g	3.5	2.8	2.6	1.3
<i>RM-10S</i>		<i>South Background</i>		<i>RM-10W</i>	
<i>West Background</i>					
Aluminum	mg/kg	2,330	1,410	1,850	3,050
Antimony	mg/kg	< 4	< 3.93	< 4.2	5.82
Arsenic	mg/kg	5.90	< 2.83	19.3	4.49
Barium	mg/kg	26.4	13.1	20.4	30.4

Table 2.12. USEC sediment monitoring program monitoring results – 1999 (continued)

Analyte	Units	Spring	Fall	Spring	Fall
		<i>Background Creeks</i>			
		<i>RM-10S</i>	<i>South Background</i>	<i>RM-10W</i>	<i>West Background</i>
Beryllium	mg/kg	0.21	0.116	0.32	0.511
Cadmium	mg/kg	< 0.23	< 0.222	1.10	2.14
Calcium	mg/kg	689	982	594	860
Chromium	mg/kg	3.9	2.37	4.5	7.44
Copper	mg/kg	5.6	2.17	6.7	11.1
Iron	mg/kg	5340	4,240	9,500	17,100
Lead	mg/kg	6.5	< 2.83	5.9	8.57
Magnesium	mg/kg	585	561	471	780
Manganese	mg/kg	130	90.5	232	251
Mercury	mg/kg	< 0.02	< 0.025	< 0.02	0.027
Nickel	mg/kg	4.5	3.12	13.6	24.2
Potassium	mg/kg	242	118	302	554
Selenium	mg/kg	4.9	< 3.26	6.6	11.3
Silicon	mg/kg	109	245	168	317
Silver	mg/kg	0.65	0.426	2.20	3.75
Thallium	mg/kg	< 3.9	< 3.77	4.5	< 3.44
Zinc	mg/kg	24.1	38.6	41.8	75.6
Total PCBs	Fg/g	< 0.5	< 0.5	< 0.5	< 0.5
Gross Alpha Activity	pCi/g	< 6	< 6	< 6	7
Gross Beta Activity	pCi/g	< 16	10	< 17	< 10
Technetium	pCi/g	< 0.2	< 0.1	< 0.2	< 0.2
Uranium	Fg/g	3.3	2.7	5.2	4.8

Table 2.13. USEC soil monitoring program results – 1999

Location	Gross Alpha (pCi/g)		Gross Beta (pCi/g)		Technetium(pCi/g)		Uranium (Fg/g)	
	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall
<i>Internal soil samples</i>								
RIS 1	9	9	10	19	1.4	0.3	3.8	2.1
RIS 3	7	39	18	23	< 0.2	1.8	3.5	10.3
RIS 5	8	8	11	12	< 0.2	4.7	5.2	4.7
RIS12	13	18	20	23	6.8	7.6	4.3	7.6
RIS15	6	11	< 9	20	< 0.2	< 0.2	3.5	5.5
RIS17	10	7	10	< 11	< 0.2	< 0.1	3.6	3.3
RIS19	26	62	57	58	34.1	20.8	19.7	17.4
RIS22	16	15	26	22	5.0	6	6.1	6.0
RIS25	6	8	9	< 8	0.9	< 0.2	4.2	3.5
RIS26	13	20	19	12	6.3	3.5	4.1	3.5
RIS32	20	11	< 18	12	3.2	4.1	5.7	4.1
RIS33	11	22	< 19	24	0.3	6.5	3.3	6.5
RIS34	14	13	46	16	13.9	3.6	8.2	3.6
RIS35	12	7	10	10	< 0.2	< 0.2	4.1	3.1
RIS36	< 7	5	< 18	8	< 0.3	3.6	3.1	3.6
<i>External soil samples</i>								
<i>Group I – on-site (DOE reservation)</i>								
SAS 3	< 6	10	10	< 12	< 0.2	0.2	3.6	2.8
SAS 8	< 5	8	14	< 16	< 0.2	< 0.1	3.0	3.3
SAS 9	7	7	11	< 11	< 0.2	< 0.1	3.4	4.2
SAS10	9	11	14	14	< 0.3	< 0.2	2.8	3.3
SAS11	< 8	9	10	17	0.6	0.2	3.7	3.5
SAS12	< 6	8	10	< 16	< 0.3	< 0.1	3.9	3.1
SAS15	< 7	10	14	< 16	< 0.3	0.1	3.5	3.4
SAS23	< 6	12	< 17	< 16	< 0.3	< 0.1	3.0	2.6
SAS24	< 7	11	10	< 16	< 0.3	< 0.1	3.7	3.2
SAS13	7	9	< 17	< 16	< 0.2	< 0.1	3.9	3.4
SAS14	13	11	24	20	0.3	0.2	4.2	3.5
SAS16	< 6	8	17	< 16	< 0.3	< 0.1	3.6	2.7
SAS20	6	8	11	< 16	< 0.3	< 0.1	3.8	2.6
SAS27	10	6	15	< 16	< 0.2	< 0.1	4.2	3.2
SAS29	< 6	7	< 9	< 8	< 0.3	< 0.2	2.7	2.3

Table 2.13. USEC soil monitoring program results – 1999 (continued)

Location	Gross Alpha (pCi/g)		Gross Beta (pCi/g)		Technetium(pCi/g)		Uranium (Fg/g)	
	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall
<i>Group II – off-site (up to 5 km off-site)</i>								
SAS 1	< 6	5	11	14	< 0.2	< 0.1	4.4	2.8
SAS 2	< 7	8	12	16	< 0.3	< 0.1	2.7	2.8
SAS 4	< 5	16	17	< 16	< 0.2	< 0.1	3.1	2.7
SAS 6	< 6	6	12	18	< 0.2	< 0.1	3.5	2.5
SAS17	< 8	12	11	< 16	0.8	< 0.1	3.3	2.2
SAS18	< 7	7	< 9	< 16	< 0.3	< 0.1	2.4	2.7
SAS19	< 8	6	15	< 16	< 0.3	< 0.1	2.6	2.7
SAS21	11	< 4	19	< 16	< 0.3	< 0.1	4.0	3.4
SAS22	< 6	10	9	< 16	< 0.3	< 0.1	3.9	2.9
SAS25	< 6	12	16	17	< 0.2	< 0.1	3.7	3.2
SAS26	8	16	15	< 16	< 0.2	< 0.1	4.6	4.8
SAS28	< 5	7	12	< 16	< 0.2	< 0.1	3.7	2.9
<i>Group III – Remote (5 to 16 km off-site)</i>								
RS10N	< 5	8	14	16	0.5	< 0.1	3.6	3.0
RS10E	< 5	7	< 8	< 16	< 0.2	< 0.1	2.9	2.2
RS10S	< 5	8	14	< 16	< 0.2	< 0.1	3.1	3.2
RS10W	8	12	20	15	< 0.2	< 0.1	6.2	5.2

Table 2.14. USEC vegetation monitoring program results – 1999

Location	Fluorides (Fg/g)		Technetium (pCi/g)		Uranium (Fg/g)	
	Spring	Fall	Spring	Fall	Spring	Fall
<i>Internal vegetation samples</i>						
RIV 1	4.3	4.2	< 0.4	< 0.4	< 0.25	< 0.25
RIV 3	5.5	7.4	< 0.4	3.4	< 0.25	< 0.25
RIV 5	14.0	22.6	< 0.4	0.2	< 0.25	< 0.25
RIV12	6.0	45.8	0.8	2.6	< 0.25	< 0.25
RIV15	2.0	8.6	< 0.4	< 0.1	< 0.25	< 0.25
RIV17	3.8	1.5	< 0.4	< 0.4	< 0.25	< 0.25
RIV19	12.5	15.0	0.7	30.9	< 0.25	< 0.25
RIV22	6.2	56.8	0.8	9.7	< 0.25	< 0.25
RIV25	5.7	17.4	< 0.4	1.2	< 0.25	< 0.25
RIV26	5.5	13.8	0.6	10.0	< 0.25	< 0.25
RIV32	7.6	12.6	0.8	4.1	< 0.25	< 0.25
RIV33	8.4	10.4	< 0.4	2.4	< 0.25	< 0.25
RIV34	6.8	7.2	1.5	1.1	< 0.25	< 0.25
RIV35	1.1	8.6	< 0.4	0.1	< 0.25	< 0.25
RIV36	2.5	10.3	< 0.4	0.3	< 0.25	< 0.25
<i>External vegetation samples</i>						
<i>Group I – on-site (DOE reservation)</i>						
SAV 3	3.5	3.5	< 0.3	< 0.1	< 0.25	< 0.25
SAV 8	15.7	1.0	< 0.3	< 0.4	< 0.25	< 0.25
SAV 9	1.6	4.0	< 0.3	< 0.1	< 0.25	< 0.25
SAV10	1.7	3.0	< 0.3	< 0.4	< 0.25	< 0.25
SAV11	8.4	1.8	< 0.4	1.2	< 0.25	< 0.25
SAV12	4.2	3.1	< 0.5	< 0.1	< 0.25	< 0.25
SAV15	3.3	6.6	< 0.4	< 0.4	< 0.25	< 0.25
SAV23	3.3	4.2	< 0.3	< 0.1	< 0.25	< 0.25
SAV24	5.0	1.5	7.3	0.4	< 0.25	< 0.25
SAV13	1.9	4.1	< 0.3	< 0.1	< 0.25	< 0.25
SAV14	1.8	1.4	< 0.3	0.5	< 0.25	< 0.25
SAV16	3.2	1.9	< 0.5	< 0.4	< 0.25	< 0.25
SAV20	3.0	3.1	< 0.3	< 0.4	< 0.25	< 0.25
SAV27	1.5	< 1.0	< 0.3	< 0.1	< 0.25	< 0.25
SAV29	4.2	4.4	< 0.4	< 0.1	< 0.25	< 0.25

Table 2.14. USEC vegetation monitoring program results – 1999 (continued)

Location	Fluorides (Fg/g)		Technetium (pCi/g)		Uranium (Fg/g)	
	Spring	Fall	Spring	Fall	Spring	Fall
<i>Group II – off-site (up to 5 km off-site)</i>						
SAV 1	2.0	2.1	< 0.4	< 0.4	< 0.25	0.25
SAV 2	2.1	3.2	< 0.4	< 0.4	< 0.25	< 0.25
SAV 4	1.2	< 1.0	< 0.3	< 0.1	< 0.25	< 0.25
SAV 6	3.6	5.8	< 0.4	< 0.1	< 0.25	< 0.25
SAV17	4.0	1.9	< 0.4	< 0.4	< 0.25	< 0.25
SAV18	6.4	6.0	< 0.4	< 0.4	< 0.25	< 0.25
SAV19	2.2	1.5	< 0.5	< 0.4	< 0.25	< 0.25
SAV21	5.5		< 0.3		< 0.25	
SAV22	2.7	1.6	< 0.3	< 0.1	< 0.25	< 0.25
SAV25	2.1	1.5	< 0.3	< 0.4	< 0.25	< 0.25
SAV26	1.7	1.4	< 0.3	< 0.4	< 0.25	< 0.25
SAV28	3.4	2.3	< 0.4	< 0.1	< 0.25	< 0.25
<i>Group III – Remote (5 to 16 km off-site)</i>						
RV10N	< 1.0	2.1	< 0.3	< 0.1	< 0.25	< 0.25
RV10E	3.4	1.1	< 0.3	< 0.1	< 0.25	< 0.25
RV10S	2.2	< 1.0	< 0.3	< 0.1	< 0.25	< 0.25
RV10W	< 1.0	2.5	< 0.4	< 0.4	< 0.25	< 0.25

Table 2.15. USEC biota (fish) monitoring program results – 1999

Location	Type	Chromium (mg/kg)	PCB (Total) (Fg/g)	Gross Alpha Activity (pCi/g)	Gross Beta Activity (pCi/g)	Technetium (pCi/g)	Uranium (Fg/g)
Scioto River, RW-1	Catfish	< 1	0.5	< 4	< 7	0	< 0.5
Little Beaver Ck, RW-8	Bass, Large Mouth	< 1	2.7	< 5	< 8	0	< 0.5
Little Beaver Ck, RW-8	Creek Chub	< 1	1.4	< 5	< 8	0	< 0.5
Little Beaver Ck, RW-8	Blue Gill	< 1	1.0	< 4	< 8	0	< 0.5
Little Beaver Ck, RW-8	Bass, Rock	< 1	0.9	< 4	< 7	0	< 0.5
Scioto River, RW-1	Drum	< 1	0.5	< 5	< 8	0	< 0.5
Scioto River, RW-6	Catfish	< 1	< 0.5	< 4	< 7	0	< 0.5
Scioto River, RW-6	Drum	< 1	0.9	< 4	< 7	0	< 0.5
Scioto River, RW-1	Drum	1	< 0.5	< 5	< 8	0	< 0.5
Scioto River, RW-1	Catfish	< 1	< 0.5	NR	NR	NR	< 0.5
Scioto River, RW-6	Bass, Stripped	< 1	0.55	< 4	< 9	0	< 0.5
Scioto River, RW-6	Shad	< 1	1.40	< 5	< 11	0	< 0.5
Scioto River, Outfalls 003/004	Drum	< 1	0.54	< 2	< 4	0	< 0.5

NR – Not reported.

Table 2.16. USEC biota (crops) monitoring program results – 1999

Type	Location	Technetium (pCi/g)	Uranium (Fg/g)
Apple	PORTS1	< 0.3	< 0.25
Corn	Offsite 1	< 0.3	< 0.25
Tomatoes	Offsite 1	< 0.3	< 0.25
Corn	Offsite 2	< 0.3	< 0.25
Tomatoes	Offsite 2	< 0.3	< 0.25
Pumpkin	Offsite 2	< 0.3	< 0.25
Apple	Offsite 2	< 0.3	< 0.25
Tomatoes	Offsite 3	< 0.3	< 0.25
Bell Peppers	Offsite 3	< 0.3	< 0.25
Pumpkin	Offsite 3	< 0.3	< 0.25
Blackberries	Offsite 3	< 0.3	< 0.25
Raspberries	Offsite 3	< 0.3	< 0.25
Corn	Offsite 4	< 0.3	< 0.25
Broccoli	Offsite 4	< 0.3	< 0.25
Tomatoes	Offsite 4	< 0.3	< 0.25
Apple	Offsite 4	< 0.3	< 0.25
Apple	Offsite 5	< 0.2	< 0.05
Tomatoes	Offsite 6	< 0.3	< 0.05
Corn	Offsite 6	< 0.3	< 0.05
Cabbage	Offsite 6	< 0.3	< 0.05
Apple	PORTS2	< 0.3	< 0.05
Apple	PORTS3	< 0.2	< 0.05
Persimmons	PORTS4	< 0.3	< 0.05
Apple	Offsite 7	< 0.3	< 0.05

PORTS1 Inside Perimeter Road, southeast of plant
 PORTS2 Apple Tree @ X-230L North Holding Pond
 PORTS3 Fog Road
 PORTS4 Cylinder Yard North of H Lot

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3. DOSE

This section provides summary tables for dose calculations completed by DOE/PORTS. Information is provided for the dose calculation required by the National Emission Standards for Hazardous Air Pollutants for airborne radionuclide emissions. Only DOE air emission sources are included; information on USEC air emission sources is not provided.

The following tables are provided in this section:

- Table 3.1. Curies released by DOE air emission sources in 1999
- Table 3.2. DOE air emission source parameters and receptor locations used in 1999 dose calculations
- Table 3.3. Predicted radiation doses from airborne releases (DOE sources only) at DOE/PORTS for 1999

Table 3.1. Curies released by DOE air emission sources in 1999

Nuclide	X-744G Glove Box	X-326 L-cage Glove Box	Total
Actinium-228	7.5E-12	5.7E-12	1.3E-11
Americium-241	7.7E-12	8.0E-13	8.5E-12
Beryllium-7	9.2E-12	less than detection	9.2E-12
Bismuth-212	4.4E-11	less than detection	4.4E-11
Bismuth-214	1.1E-11	6.5E-12	1.8E-11
Lead-212	1.4E-10	9.6E-12	1.5E-10
Lead-214	2.2E-11	1.1E-11	3.3E-11
Neptunium-237	3.2E-11	1.2E-11	4.4E-11
Plutonium-238	2.5E-11	5.1E-14	2.5E-11
Plutonium-239/240	3.7E-11	1.2E-12	3.8E-11
Potassium-40	4.4E-10	2.6E-10	7.0E-10
Protactinium-233	5.4E-11	4.9E-13	5.4E-11
Protactinium-234	7.2E-11	4.2E-11	1.1E-10
Protactinium-234m	4.7E-07	2.0E-08	4.9E-07
Radium-224	9.1E-11	4.8E-11	1.4E-10
Radium-226	1.1E-10	1.1E-11	1.2E-10
Radium-228	7.5E-12	5.7E-12	1.3E-11
Technetium-99	1.4E-05	4.6E-05	6.1E-05
Thallium-208	2.9E-11	2.6E-12	3.2E-11
Thorium-228	2.9E-10	7.5E-12	2.9E-10
Thorium-230	4.1E-10	1.4E-11	4.2E-10
Thorium-231	5.2E-08	5.7E-09	5.8E-08
Thorium-232	1.6E-12	less than detection	1.6E-12
Thorium-234	2.1E-07	1.1E-08	2.2E-07
Uranium-234	1.9E-06	1.6E-07	2.1E-06
Uranium-235	8.5E-08	6.0E-09	9.1E-08
Uranium-236	8.2E-09	6.6E-10	8.9E-09
Uranium-238	4.7E-07	1.0E-08	4.8E-07

The emissions (in curies) activities listed above are based on the mass of various materials handled by each of the gloveboxes, the analytical data available on each material, and the emission calculation procedures outlined in 40 CFR 61 Appendix D. Emissions are calculated using the following procedure.

- 1) Determine the mass of each material handled in each glovebox.
 - S The mass of the materials handled is calculated from the batching log sheets that indicate the grams of each material in each container handled in the glovebox for the calendar year.
 - S The total mass of each material is a sum of the mass values for each of the individual containers.
- 2) Determine the radionuclide mass concentrations present in each material.
 - S An average concentration for each of the radionuclides present in each material handled in the gloveboxes is calculated from analytical data on that material.
 - S For the materials handled in these gloveboxes, over 51 percent of the concentrations are based on one or two samples; therefore, a statistical upper confidence interval has not been calculated for any of the radionuclide concentrations.
- 3) Calculate the mass of the radionuclide handled in the glovebox.
 - S Multiply the mass of each material by the radionuclide concentrations for that material.
- 4) Calculate pre-control emissions of each radionuclide.
 - S Multiply the mass of each radionuclide handled in the glovebox by 0.001 to calculate the mass of the radionuclide emitted from the glovebox into the vent stream.
 - S The emission factor of 0.001 is from 40 CFR 61 Appendix D, 2.b.ii for particulate solids.
- 5) Calculate post-control emissions of each radionuclide.
 - S Multiply the pre-control emissions by 0.01 to calculate the mass of the radionuclide emitted from the vent stack into the atmosphere.
 - S The emission factor of 0.01 is from 40 CFR 61 Appendix D, Table 1 for high efficiency particulate air (HEPA) filter control of particulate emissions.
 - S These post-control emissions, in Curies, become the input parameters for the CAP88-PC modeling program.

Table 3.2. DOE air emission source parameters and receptor locations used in 1999 dose calculations

Name	Type	Release height (m)	Inner diameter (m)	Gas exit velocity (m/s)	Gas exit temperature (°C)	Distance (m) and direction to receptor ^a
X-744G Glove Box	Point	6	0.05	6.98	Ambient	1,067 ENE
X-326 L-cage Glove Box	Point	22	0.36	6.35	Ambient	2,286 NE

^a Receptor is location of maximally exposed individual (resident living near the plant who received the greatest dose resulting from DOE air emissions).

Table 3.3. Predicted radiation doses from airborne releases (DOE sources only) at DOE/PORTS for 1999

Effective dose equivalent to:	Effective dose equivalent
Maximally exposed individual ^a	0.00048 mrem/year
Population ^b	0.77 person-mrem/year
Nearest community ^c	0.12 person-mrem/year

^a Maximally exposed individual (based on combined DOE stacks) resides 1,067 m (3,500 ft) ENE of the X-744G Glove Box and 2,286 m (7,500 ft) NE of the X-326 L-cage Glove Box.

^b Collective effective dose equivalent to population within 50 miles (80 km) of plant site.

^c Collective effective dose equivalent to residents of nearest community (Piketon, Ohio), which for modeling purposes is conservatively assumed to be 2 miles (3500 m) north of the plant site.

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4. GROUNDWATER

This section summarizes analytical results for groundwater monitoring at PORTS in 1999 at the following locations:

- X-749/X-120/Peter Kiewit (PK) Landfill,
- Quadrant I Groundwater Investigative Area/X-749A Classified Materials Storage Yard,
- Quadrant II Groundwater Investigative Area,
- X-701B Holding Pond,
- X-616 Chromium Sludge Surface Impoundments,
- X-740 Hazardous Waste Storage Facility,
- X-611A Former Lime Sludge Lagoons,
- X-735 Landfills,
- Surface water monitoring locations, and
- Exit pathway monitoring locations.

Results for radiological parameters and volatile organic compounds are reported in this section. All results are included for radiological parameters, even if a specific constituent was not detected at a specific well or location during any sampling event in 1999. Results for chromium at the X-616 are also included in this section because chromium is of special concern in this area.

This section also provides results for beryllium and chromium at the X-611A because these are the only monitoring parameters for this area.

Only those volatile organic compounds that were detected in at least one sampling event are listed in this section. A table for volatile organic compounds at the X-735 Landfills is not provided because volatile organic compounds were not detected at this area. Complete groundwater monitoring results are provided in the *1999 Annual Groundwater Monitoring Report*.

Data qualifiers are letters or symbols used to provide additional information about the analytical results provided in this section. The meaning of each data qualifier is provided below:

- U Undetected. The number provided is the detection limit for the sample.
- B Radionuclides and metals: the reported value was obtained from a reading that was less than practical quantitation limits but greater than or equal to the instrument detection limit.
Volatile organic compounds: the analyte was detected in the blank sample.
- * Duplicate analysis is not within control limits.
- D The reported value was identified from a secondary dilution.
- E The reported value is estimated because of the presence of interferences.
- J The reported value is qualified as estimated.
- N Spike sample recovery is not within limits.

The following tables are included in this section:

- Table 4.1. Volatile organic compounds detected at the X-749/X-120/PK Landfill
- Table 4.2. Results for radionuclides at the X-749/X-120/PK Landfill
- Table 4.3. Volatile organic compounds detected at the Quadrant I Groundwater Investigative Area
- Table 4.4. Results for radionuclides at the Quadrant I Groundwater Investigative Area
- Table 4.5. Volatile organic compounds detected at the Quadrant II Groundwater Investigative Area
- Table 4.6. Results for radionuclides at the Quadrant II Groundwater Investigative Area
- Table 4.7. Volatile organic compounds detected at the X-701B Holding Pond
- Table 4.8. Results for radionuclides at the X-701B Holding Pond
- Table 4.9. Volatile organic compounds detected at the X-616 Chromium Sludge Surface Impoundments
- Table 4.10. Results for chromium at the X-616 Chromium Sludge Surface Impoundments
- Table 4.11. Results for radionuclides at the X-616 Chromium Sludge Surface Impoundments
- Table 4.12. Volatile organic compounds detected at the X-740 Hazardous Waste Storage Facility
- Table 4.13. Results for radionuclides at the X-740 Hazardous Waste Storage Facility
- Table 4.14. Results for beryllium and chromium at the X-611A Former Lime Sludge Lagoons
- Table 4.15. Results for radionuclides at the X-735 Landfills
- Table 4.16. Volatile organic compounds detected at surface water monitoring locations
- Table 4.17. Results for radionuclides at surface water monitoring locations
- Table 4.18. Results for radionuclides at exit pathway monitoring locations